Century Mine
American Energy Corporation
In GOD We Trust

September 15, 2012

Mr. Bruce Goff
Ohio Environmental Protection Agency
Division of Surface Water
2195 Front Street
Logan, OH 43138

RE: Response to Comments, Bennoc Area NPDES OIL00159 Application for American Energy Corporation in Belmont County, Ohio

Dear Mr. Goff,

Please find the attached packet containing our responses, along with supporting documentation, in regards to your and Mr. Nygaard's comments. The comments were received via email between the dates 7/11/12 and 8/21/12.

American Energy Corporation (AEC) conducted a biological investigation on the two unnamed tributaries. Based on this investigation, the unnamed tributaries have no significant biological value contributing to the receiving waters of Piney Creek and its habitat. Therefore, AEC has conducted our modeling with Piney Creek as the receiving waters and not the end of pipe from the ponds. AEC believes that we have a comprehensive packet, not only addressing anti-degradation, but the biology and receiving streams ability to assimilate pollutants from the ponds as well.

The attached packet contains the following documents:

- Two (2) copies of *Response to OEPA Comments from Bruce Goff and Eric Nygaard – Dated 8/21/12, 8/15/12, 7/20/12, 7/13/12, and 7/11/12 – Bennoc NPDES Permit Application – OIL00159*
- Two (2) copies of *Hydro-Chemical Analysis of Waste Water Discharge and Anti-Degradation Assessment: American Energy Corporation's Bennoc Coarse Coal Refuse Area Ponds 001 and 020* (with attachments)
- Two (2) copies of *Investigation of Unnamed Tributaries to Piney Creek – NPDES Permit Application OIL00159 – Bennoc Refuse Area – American Energy Corporation*
- Two (2) copies of the drawing "Site Plan View" (Sheet C1)
- Two (2) copies of the drawing "Sections A'-A & B'-B" (Sheet C2)
- Two (2) copies of the drawing "Ponds 001 & 002 Data" (Sheet C5)

43521 MAYHUGH HILL ROAD • BEALLSVILLE OHIO 43716
(740) 926-9152 • FAX (740) 926-9138

If you have any questions, please contact me at 740.338.3100, or email me at jnagel@coalsource.com. We look forward to your review and decision on this permit. Thank you for your time and cooperation.

Sincerely,

Jon M. Nagel
Coordinator of Environmental Compliance

Encl. (2) Copies
CC: G. Chris Van Beaver
Jason D. Witt
James R. Turner
C. Crellin Scott
File (\Env Files\AEC\OEPA\NPDES\0IL00159 Bennoc Refuse Area\Corresp)

Response to OEPA Comments from Bruce Goff and Eric Nygaard Dated 8/21/12, 8/15/12, 7/20/12, 7/13/12, and 7/11/12 Bennoc NPDES Permit Application OIL00159

Bruce Goff had these questions/comments on 8/21/12:

Comment: In email below we asked that actual background WQ data be used for the "modeling". Our interactive WQ map is now working and the WQ data for Piney Creek can be accessed. I've attached the data. The downstream data file has a filter for the parameters. On the right side of the worksheet I've averaged the data for chloride, sulfate, TDS and hardness.

Response: We have included the actual background water quality in the revised Waste Load Allocation Model. The relevant changes can be found in "Hydro-Chemical Analysis of Waste Water Discharge and Anti-Degradation Assessment: American Energy Corporation's Bennoc Coarse Coal Refuse Area Ponds 001 and 002" Table 4 (page 7) which includes the Cold Water Habitat for Piney Creek and hardness value of 283 mg/L. In addition the WQS spreadsheet has been updated in the document to reflect the Ohio EPA water quality background data for sulfate, hardness, alkalinity and chloride. These changes can be found in pages 10 through 14 and summarized in the Table, sulfate WQS spreadsheet, on page 14. The revised WLA is attached to this document and additional details are provided in the responses below.

Comment: In email below I asked for details of the ponds outlet construction showing how the discharge will be "controlled". I was looking at the plans and I noticed a note on sheet C1 that says the two ponds will be "enlarged". When we were talking about this project during our meeting(s) here at this office I think we were told the ponds would remain the same size and no changes would be made to them. If they are enlarged, OEPA will need a Permit to Install application for that. It's too late now to include a PTI application with this NPDES action, since we'd have to start the public notice period over again. The PTI application would have to be submitted after the NPDES permit is issued. Anti-degradation would not apply to the PTI application.

Response: In the initial Bennoc Area Coarse Coal Refuse Disposal Individual NPDES application, the Anti-Degradation Addendum's attachment states that the ponds will be enlarged. This statement is in the summary on page one (1) of this attachment, and multiple times on page two (2): addressing items C.4.c.1, C4, and C.4.d.

Comment: We do need to see some details of the "enlarged" ponds with this NPDES application to document what the "preferred alternative" is for treatment. Please submit some details of the pond construction and a general description of the ponds (volume, freeboard, chemical addition equipment, how discharge will be controlled, etc.) as an amendment to the NPDES application/antidegradation addendum.

Response: Pond specifications can be found in the attached drawing "Ponds 001 & 002 Data". Chemical treatment will be induced to the pond with the application of ChemStream's wheel treatment system. Further detail of this treatment system can be found in the third response to comments received 7/20/12.

Comment: Also send us some typical cross sections of the refuse disposal area. Include a cross section before disposal of refuse, a cross section during disposal and a final cross section showing final grades and reclamation.

Response: Cross sections of the area for before disposal and after reclamation can be found in the attached drawing Sections A'-A & B'. During disposal cross-sections would be difficult to supply due to the constant change during construction.

Eric had these questions/comments on the modeling done by Dr. Walker on 8/15/12:

Comment: Please show how the critical flow in your analysis was derived. It is not obvious to me from the USGS stats that you submitted. It seems that this discharge is an annual average flow, which really limits how often they could discharge. For a small stream that could be very helpful.

Response: These flows are shown in detail in Attachments 4, 7 and 8 in the original and revised report, "Hydro-Chemical Analysis of Waste Water Discharge and Anti-Degradation Assessment: American Energy Corporation's Bennoc Coarse Coal Refuse Area Ponds 001 and 002". Attachment 4 of the report outlines the USGS stream stats for Piney Creek at the mouth of Captina Creek and Attachment 7 outlines the average monthly flows for Piney in both wet and dry years. The September flow from this spreadsheet was the lowest and used in the modeling (0.32 cfs). To check our use of this flow we also calculated the low flows as described in the USGS paper (Water Research Report 86-4354). This paper was attached as Attachment 4 and our complete calculations using this method are described in detail in Attachment 8. The result of the calculated low flow was 0.27 cfs, very close to the observed monthly low flow of 0.32 cfs.

Comment: To calculate hardness and chloride levels for use in outside mixing zone WQS and wasteloads, I suggest using the local survey data that we collected in Piney Creek @ SR 148. This data is available on our interactive maps web site. (http://wwwapp.epa.ohio.gov/dsw/gis/wq/index.php) I think that both we and USEPA would prefer the use of local data if we have it. Effluent hardness and chloride can be used to calculate inside-mixing-zone maximum WQS since these numbers apply at the discharge point.

Response: We have recalculated sulfate and chloride based on the background water quality that Ohio EPA has provided. The Table below illustrates the original calculations versus the new calculations using Ohio EPA background water quality for Piney Creek:

Criteria	**Original Sulfate or Chloride Computed WQS**	**Revised Sulfate or Chloride WQS***
Acute WQS Sulfate	1158	6942
IMZM Sulfate	1505	9025
Acute WQS Chloride	623	578
Chronic WQS Chloride	385	357

*Computed using Ohio EPA background data: hardness =283 mg/L, sulfate = 554 mg/L and chloride = 168 mg/L

Comment: Please use CWH criteria for the allocation of these outfalls. To clarify earlier comments, the CWH existing use needs to be considered because this application/permit is going through an antidegradation review. This review requires that existing uses as well as designated uses be maintained.

Response: The WLA modeling was repeated using the Cold Habitat Water criteria. The complete revised WLA is attached.

Comment: I like the use of 20% of the critical flow – it leaves plenty of assimilative capacity for Century Mine outfalls.

Response: Noted, we have used the 20% critical flow for this evaluation. However, we believe that substantially more mixing can occur within the stream since the discharges do not occur during low flow events. Please see the next response below.

Comment: Internally, we (OEPA) still need to work out the issues of appropriate WQ based effluent limits for the small tributaries/drainage ways the two ponds discharge into, including the appropriate IMZM based limit and if any consideration can be given to the fact the discharges may be controlled and may only occur during wet weather. This is the same issue we talked about with North Star's discharges.

Response: The underlying concept used in the model for mixing of the discharge with the receiving water is that the maximum concentration of a given chemical or analyte in the effluent at the daily average effluent rate is mixed with the

7Q10 of the receiving water. In other words, the highest observed effluent concentration is mixed with Creek water under the lowest flow conditions. While this concept makes sense for industrial processes that discharge continuously regardless of ambient meteoric conditions, it does not make sense for scenarios where both the discharging water body flows and the receiving water body flows are both dependent on the same environmental conditions. For example, the 7Q10 is used to be protective of aquatic life when discharge occurs during low flow. However, the Bennoc ponds will also be low during the Creek low flow conditions because it receives water exclusively from runoff, much like the receiving water body. Currently there exists no mechanism in the permit process by which these observations can be accounted for. For the purpose of the present permitting process, the model calculations in this report were carried out under Ohio EPAs suggested mixing model but the appropriateness of the model as it applies to intermittent discharges such as Bennoc, should be open for discussion.

It is instructive to note that low flow conditions for Piney creek used in the model are measured flow rates via a staff gauge. The low flow condition was determined to be 0.32 cfs and occurred in September. Calculations of low flow conditions for Piney Creek were completed according to the USGS Water Research Report 86-4354. The low flow from the USGS estimation was 0.27 cfs. Rainfall data for the same month suggesting that low flow conditions are maintained by less than 1 inch of rain in a month. Under these conditions, there is little runoff reporting to the ponds and sufficient freeboard to prevent discharge to Piney Creek. Hence the assumptions inherent in the model fail under hydrologic conditions specific to the AEC ponds. Consequently, a more accurate method of depicting intermittent discharges and stream mixing should be developed. Perhaps a high frequency storm event, such as the 1-year, 1-hour storm, should be used to determine both the design discharge rate and corresponding receiving water flow rate for these discharges.

Comment: We need more information about the treatment ponds outlet structures. If the discharges will not occur during dry weather and will be controlled, we need to see the pond outlet structure details showing how this will be accomplished. For example, the ponds shouldn't have an outlet/principal spillway that allows the pond to slowly discharge after it fills. What may be needed is a way to shut off the ponds outlet and have it manually opened to lower the pond water elevation and close it off after a few hours of discharging and repeat this every two weeks or so. Of course the pond would still have the emergency overflow in case of extreme wet weather.

Response: The ponds in this application are designed to discharge over a pipe with a riser attached. The only time the pond would be able to top the riser is during wet weather which supplies enough runoff to cause the water to do so. During dry weather, the pond will not receive any inlet flow, due to their exclusiveness of inlet flow being only surface runoff water, and will not be able to discharge.

Comment: I don't know if would be on any use to us to help with permitting, but if you can have your biologists look at the two small tribs that both ponds discharge into and evaluate their potential for aquatic life use, that may be helpful.

Response: A field investigation was completed on July 13, 2012. The results of this investigation can be found in the attached report, "Investigation of Unnamed Receiving Tributaries to Piney Creek."

Bruce Goff had these comments on 7/20/12:

Comment: What is the status of review of the refuse disposal by ODNR and US MSHA and OSM? Are both MSHA and OSM permitting this?

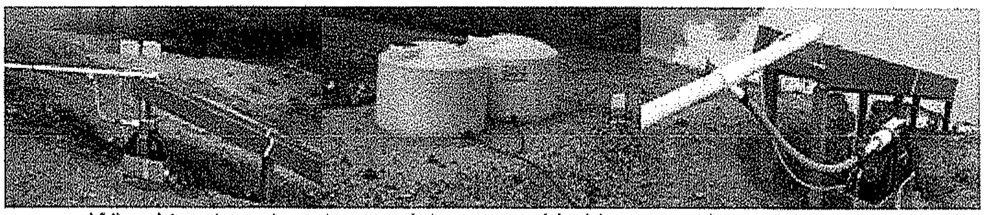
Response: ODNR has deemed the application complete, and first round of technical revisions have been received and are being answered. MSHA and OSM will not be reviewing or issuing any permits for this application.

Comment: Did ODNR have any comments about the treatment ponds design? I'm not sure if their review criteria for treatment ponds at mine refuse areas are different than for ponds as surface mines.

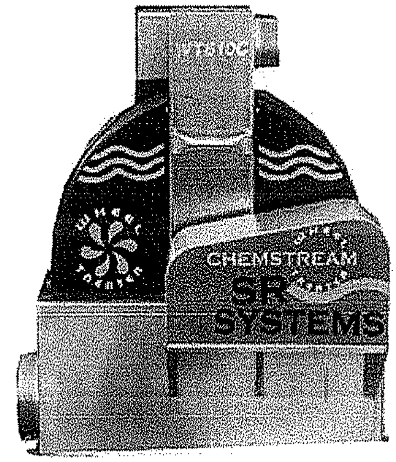
Response: At this time, no technical comments have been received from ODNR. The ODNR engineering design criteria is not any different for refuse or surface mine ponds.

Comment: Do you happen to have any photos of the treatment ponds, the outlet structures, the chemical feed equipment and the discharge drainage ways (outlet ditches) you can share?

Response: We do not have any pictures of the proposed treatment ponds and their structures. However, we do have a picture (below) of the proposed wheel treatment system.



Wheel treatment system – pictures provided by www.chemstream.com



Wheel treatment system – pictures provided by www.chemstream.com

Bruce Goff had these questions/comments on 7/13/12:

Comment: What about the option of diverting both ponds discharges directly to Piney Creek so we can avoid the issue of applying WQS in the small tributaries?

Response: In light of existing conditions in the unnamed tributaries there is no need to extend the outlet to Piney Creek. The biological status on both tributaries is low to non-existent based on our biologist survey, "Investigation of Unnamed Receiving Tributaries to Piney Creek."

Comment: Another issue is that Piney Creek existing use is cold water habitat. We'll change this in future rulemaking, but our rules require that existing use be protected (even if that use isn't in rule yet). So the modeling you've done will have to be for meet WQS for cold water habitat. I understand that may make a difference for some metals, e.g. cadmium, but not for TDS and sulfate. Please be prepared to address this in the modeling.

Response: We have changed the designation in the model to CWH. The revised WLA is attached but the salient results are summarized in the response below.

Comment: It doesn't appear that our IMZM standard for sulfate was considered in the WQ analysis. The calculated standard is 1505 of page 14. The discharge has 2433 ppm sulfate. Please address this.

Response: We have recalculated sulfate and chloride WQS based on the Ohio EPA background water quality for Piney Creek that was recently provided. The Table below illustrates the original calculations versus the new calculations using Ohio EPA Background water quality for Piney Creek:

Criteria	Original Sulfate or Chloride Computed WQS	Revised Sulfate or Chloride WQS*
Acute WQS Sulfate	1158	6942
IMZM Sulfate	1505	9025
Acute WQS Chloride	623	578
Chronic WQS Chloride	385	357

*Computed using background hardness of 283 mg/L, sulfate of 554 mg/L and chloride of 168 mg/L

Based on these results our discharges for sulfate will be well below the WQS for sulfate. The recalculated WQS compared to our discharges can be summarized as follows:

Analyte	Maximum Allowed (OMZM)	Pond 001 and 002 Combined Flow Effluent
Sulfate	6942 mg/L	2473.5 mg/L
Chloride	578 mg/L	195 mg/L
Iron	No OMZM (7952 ug/L = Average OMZM for Agricul.)	479 ug/L
Aluminum	No OMZM	504 ug/L
Manganese	No OMZM	190 ug/L
Copper	58 ug/L	6 ug/L
Zinc	461 ug/L	1 ug/L
Arsenic	547 ug/L	0.8 ug/L
Selenium	7.4 ug/L (Average OMZM Aquatic Life)	1.2 ug/L

Based on these data, there was no significant change for trace metals. Only sulfate limits were affected by the use of background data.

Bruce Goff had these questions/comments on 7/11/12:

Comment: What is the source of information for the discharge flows from the ponds used for the modeling? Please provide more details.

Response: The pond flow data were correlated with the USGS flow meter located at Armstrong Mills, Ohio. Based on the drainage area of this gauge, the average flows of ponds 001 and 002 were calculated with their respective drainage areas. This information is in Table 1 of "Hydro-Chemical Analysis of Waste Water Discharge and Anti-Degradation Assessment: American Energy Corporation's Bennoc Coarse Coal Refuse Area Ponds 001 and 002". Other pond flows and chemical data can be found in Attachment 1 and Attachment 3.

Comment: How will the ponds be designed and operated so they only discharge in wet weather? For example, will the outfall have "stop logs" or some other control mechanism? Will any changes have to be made to the ponds?

Response: The ponds are designed to have sufficient capacity and freeboard to collect runoff under 25 year, 24 hour storm events. The ponds and Piney Creek both respond to the same meteorological events such that if there is no runoff, there is no discharge. Thus the ponds will not discharge when the precipitation is low. In our paper we discussed this issue as it has bearing on the allowable mixing within the stream. The underlying concept used in the model for mixing of the discharge with the receiving water should be discussed further. While the concept makes sense for municipal industrial processes that discharge continuously regardless of ambient meteoric conditions, it does not make sense for scenarios where both the discharging water body flows and the receiving water body flows are both dependent on the same environmental conditions. As discussed earlier, the Bennoc ponds will be low and not discharging during the Creek low flow conditions. Currently there exists no mechanism in the permit process by which these observations can be accounted for.

Comment: The two unnamed tributaries were not modeled. The ponds were modeled as discharging directly to Piney Creek. Any particular reason for that?

Response: The ponds discharge through unnamed tributaries connected to Piney Creek. At the time of the report, it was assumed that these unnamed tributaries were not considered as live streams to Piney Creek. Our biologists have completed their field assessment of these unnamed tributaries and there is low to no biology in these unnamed tributaries. Therefore we didn't see how modeling would apply here. The true receiving stream is Piney Creek.

Comment: What is the biological status of the two small tributaries? Are they normally dry and only have flow during or shortly after wet weather?

Response: Normally the upper reaches of the tributaries are dry, however there exists a spring on both tributaries. Therefore the entire tributaries only flow in response to meteoric events, see Comment 2. The biological status on both tributaries is low to non-existent based on our biologist survey, "Investigation of Unnamed Receiving Tributaries to Piney Creek."

Comment: Seems that TDS was not modeled. The 30 day average of 1500 ppm for TDS must also be met.

Response: Water Quality Standards for sulfate, chloride and TDS are not included in the Waste Allocation spreadsheet (see Attachment 6 Permitting of Dissolved Inorganics for Coal Individual Permits, Eric Nygard 2011). These are given special consideration for mining sites and individual coal mine permits. For sulfate the WQS is considered as: "in permits where sulfate is the primary toxic component of TDS (sulfate is 78% of TDS in this case), a maximum sulfate WQ BEL (water quality based effluent limit) is used instead of a maximum TDS WQBEL." The sulfate WQS, according to Ohio EPA, is then computed from the background chloride and hardness data. The 25th percentile chloride and hardness data from the reference data set for mine affected sites are used as default values where no background data exist.

Comment: Any plans to control refuse placement so areas are reclaimed as soon as possible, i.e. minimize refuse area exposed to rainfall? This could be claimed as part of a minimum degradation option in the anti. addendum.

Response: Yes the reclamation of the refuse areas will be planned to minimize runoff contact with coarse coal refuse and accelerate reclamation.

Comment: It's not clear what background WQ for sulfate chloride and TDS was used. I can see where hardness came from in table 44 on page 8, but what about sulfate and chloride and TDS (if TDS is modeled). Does AEC and any background WQ information for Piney Creek or the tributaries? I think OEPA has some results of sampling we've done. We may be looking at that data and compare it to values used in the modeling.

Response: As explained above and with Ohio EPA Piney Creek background water quality data for Piney Creek, the sulfate and chloride WQS computations have been redone. The Table below illustrates the original calculations versus the new calculations using Ohio EPA Background water quality for Piney Creek:

Criteria	Original Sulfate or Chloride Computed WQS	Revised Sulfate or Chloride WQS*
Acute WQS Sulfate	1158	6942
IMZM Sulfate	1505	9025
Acute WQS Chloride	623	578
Chronic WQS Chloride	385	357

*Computed using background hardness of 283 mg/L, sulfate of 554 mg/L and chloride of 168 mg/L

Comment: Were you advised to only use 20% of the stream's flow for modeling? I am going to check on that to see if that is appropriate for a smaller stream such as this that should have good mixing, especially if modeling is based on assumption that stream flows are higher during wet weather. But maybe our WLA/Modeling rules are very specific about this.

Response: The 20% value appears to be a default value in the WLA Ohio EPA model and a conservative one at that. Since we have no field mixing data we did not try to use a larger or different percentage mixing. We are currently inspecting the flow data to determine the appropriate % mixing that should be used. Please see the fourth response from the top on page 3 of this document concerning proper evaluation of discharge mixing percentage and timing of discharges with stream flows.

Hydro-Chemical Analysis of Waste Water Discharge and Anti-Degradation Assessment: American Energy Corporation's Bennoc Coarse Coal Refuse Area Ponds 001 and 002

September 14, 2012

Submitted to:
Mr. Bruce Goff, P.E.
Permit Supervisor/Division of Surface Water
OhioEPA Southeastern District Office
2195 Front Street
Logan, Ohio 43138

Submitted by:
William J Walker, PhD
Sovereign Consulting, Inc.
2101 4th Ave Suite 2130
Seattle, WA 98121

Introduction

American Energy Corporation (AEC) requested that Sovereign Consulting, Inc. (Sovereign) perform a hydro-chemical analysis of water and solute discharge from two coarse coal refuse area ponds at AEC's Bennoc area for the purpose of determining whether the planned discharges would affect or "degrade" the water quality of Piney Creek, the receiving water body. The two ponds presently exist, but the area that will drain into the ponds does not yet store coarse coal refuse. Therefore the following analysis determines whether the discharge will degrade surface water once the ponds begin to collect water from the coarse coal refuse areas. The scope of this anti-degradation analysis includes a description of the site and the proposed discharge, the expected water chemistry of the discharge, an in-stream waste load allocation of Piney Creek, a determination of degree of degradation, and finally waste water management and treatment options if necessary.

1.) Chemical and Hydrological Characteristics of Pond 001 and Pond 002 Discharge Water

Pond Description and Features: Figure 1 displays the plan view of the Ponds, proposed coarse coal refuse area and the layout of the AEC mine, preparation plant and coal slurry impoundments. Table 1, below displays the key physiographic and hydrologic features of the two ponds, designated as Pond 001 and Pond 002 (Figure 1).

Table 1. Pond 001 and Pond 002 Hydrologic Features (source: AEC, 2012)

Feature	Pond 001	Pond 002
Area (acres)	0.58	0.27
Capacity (gallons)	26,944,110 (average)	16,613,753 (average)
Flow rate (gpd)	40,781	25,377
Flow rate (gpm)	28.3	17.6
Flow rate (cfs)	0.06	0.04
Retention time (years)	Up to 1.8	Up to 1.8
Point of discharge	Piney Creek	Piney Creek
Retention time	1.81 years	1.80 years

The ponds are relatively small and encompass between 0.6 and 0.3 acres, respectively with a capacity ranging from 16 million to 27 million gallons. The discharge flow rates are low: 40,000 gpd for Pond 001 and 25,000 gpd for Pond 002. The large capacity coupled with the low discharge rates yields a long average retention time approaching 2 years (1.8 yrs). Both Ponds will discharge to Piney Creek.

Pond Water Chemistry: Since the ponds do not yet receive water that has interacted with coarse coal refuse, the exact chemistry of the Pond 001 and 002 water is not known. However, the expected chemistry of Ponds 001 and 002 can be approximated from analysis of four (4) Pond 013 water samples collected in 2011 and 2012, and because Pond 013 is currently used to collect runoff in an active refuse area (Attachment 1). Since Ponds 001 and 002 will eventually collect water from a refuse area as well, Pond 013 serves as an appropriate surrogate to represent runoff from a refuse area. This surrogate water chemistry for Ponds 001 and 002 is shown in Table 2 and all data represents in-pond sampling events.

Table 2: Expected Water Chemistry in Ponds 001 and 002 (Average of 4 Samples Collected in December, 2011 and January 2012, source: AEC, 2012)

Analyte	Concentration (all mg/L, except pH in standard units)
pH	7.6
Alkalinity	149
Hardness	512
SO4	2438
Cl	195
Ca	201
Mg	28.4
Na	965
K	5.6
Al	0.50
As	0.0008
Cu	0.006
Fe	0.48
Mn	0.38
Zn	0.001
Se	0.0012
TDS	3138

Geochemical Changes in Pond 001 and 002 Due to Aeration and Adsorption: Eventually, with the establishment of the new coarse coal refuse area, Ponds 001 and 002 will collect, impound and discharge water associated from coarse coal refuse to Piney Creek. Once the water from the refuse area enters the Ponds, water quality is expected to improve due to in-pond geochemical changes. The improvement in water quality is due primarily to geochemical changes in the Ponds, including a combination of metal hydroxide formation (iron (Fe), aluminum (Al) and manganese (Mn)) and simultaneous trace metal adsorption to the metal oxyhydroxides. These processes are enhanced by aeration and the long retention time within Ponds 001 and 002 (1.8 years). The Al, Fe and Mn solids formed in the impoundment, very effectively adsorb trace elements such as copper (Cu), arsenic (As), selenium (Se) and zinc (Zn).

An example of the difference in chemistry between the water discharged to the Ponds and what is likely to be discharged to Piney Creek can be modeled. The change in water chemistry that occurs was simulated using the USEPA's chemical speciation program MINTEQA2 to approximate the geochemical metal removal processes in the Ponds during the long retention time. The code allows for the formation of solids if the solution is oversaturated and can model the sorption of trace elements to iron and other solids.

To carry out the simulation, the surrogate water chemistry (Pond 013 average concentrations) for Ponds 001 and 002 was entered into the program, speciation calculations performed and the output compared to the input chemistry.

The simulation results are described below and presented in Attachment 2:

- Solids formed from oversaturation:
  - $Al(OH)_3$ gibbsite
  - $CaCO_3$ calcium carbonate
  - $Fe(OH)_3$ hematite/hydrous ferric oxide
  - $MnCO_3$ manganese carbonate
- Species distribution: changes in chemistry due to adsorption on solids formed above (model prediction):
  - Al 0.01% dissolved, 99.99% precipitated as gibbsite
  - Fe 0.001% dissolved, 99.999% precipitated as ferrihydrite or ferric hydroxide
  - Mn 29% adsorbed
  - As 99.98% adsorbed
  - Cu 99.8% adsorbed
  - Se 32% adsorbed
  - Zn 97 % adsorbed
- Comparing the model input water to the Pond water after aeration and settling:
  - As measured = 0.0008 mg/L predicted = <0.000001 mg/L
  - Mn measured = 0.377 mg/L predicted = 0.27 mg/L
  - Zn measured = 0.0015 mg/L predicted = <0.00001 mg/L
  - Cu measured = 0.0063 mg/L predicted = <0.000001 mg/L
  - Se measured = 0.0012 mg/L predicted = 0.0008 mg/L

In general, the predicted metal concentrations from the model show that aeration and retention will reduce trace metal content to levels further below permit requirements and in some cases detection limits. The importance of this observation is that any increase in trace metal inputs via interaction with coarse coal refuse will be attenuated by this sorption/precipitation process in Ponds 001 and 002. All of the trace metals (As, Cu, Se, Zn, Fe, Al, and Mn) were removed at efficiencies greater than 30% and for the most part greater than 99%. As expected, the major cation and anion chemistry was largely unaffected by settling time or aeration.

With trace metal removal occurring in the pond, the discharge chemistry from the Ponds to Piney Creek can be estimated. The discharge chemistry compared to the pond input chemistry is shown in Table 3.

Table 3. Expected Effluent Discharge Chemistry from Ponds 001 and 002 to Piney Creek

Analyte	Ponds 001 and 002 Chemistry Before aeration (mg/L)	Ponds 001 and 002 Chemistry Discharge to Piney Creek (after aeration/adsorption/precipitation/sedimentation) (mg/L)
pH	7.6	7.6
TDS	3138	3138
Sulfate	2438	2438
Chloride	195	195
Alkalinity	149	145
Iron	0.48	<0.000001
Manganese	0.38	0.27
Aluminum	0.50	0.01
Zinc	0.001	<0.00001
Copper	0.006	<0.000001
Arsenic	0.0008	<0.000001
Selenium	0.0012	0.0008

A comparison of the effluent chemistry from both Pond 001 and Pond 002 to the Ohio Water Quality Standards (WQS) is presented in the next section. In addition, appropriate waste load allocations for various analytes are computed and compared to levels required to achieve the Water Quality standards in the next section.

2.) Anti-Degradation and Waste Load Allocation Analysis

The methodology for assessing the impact of the Pond water effluent on receiving water quality follows the Ohio EPA guideline rules 3745-1 and 3745-2. In this approach, effluent data (concentrations and flows) is compared to water quality standards (WQS) which are based on receiving water background concentrations. The analysis determines the concentration of various analytes in the effluent that must be met in order not to exceed the water quality standards. Each step in the Ohio EPA Waste Allocation Model (Attachment 3) courtesy Eric Nygard, Ohio EPA and Cody Mozena, AEC), analysis is presented below. For this exercise, Ponds 001 and 002 were considered in combination and not as separate flows, since they will discharge to the same receiving water body, Piney Creek.

The input parameters are described below and include waste water discharge flow rate and concentrations as well as receiving water flow rate and concentrations. The underlying concept used in the model for mixing of the discharge with the receiving water is that the maximum concentration of a given chemical or analyte in the effluent at the daily average effluent rate is mixed with the 7Q10 of the receiving water. In other words, the highest observed effluent concentration is mixed with Creek water under the lowest flow conditions. While this concept makes sense for industrial processes that discharge continuously regardless of ambient meteoric conditions, it does not make sense for scenarios where both the discharging water body flows and the receiving water body flows are both dependent on the same environmental conditions. For example, the 7Q10 is used to be protective of aquatic life when discharge occurs during low flow. However, the Bennoc ponds will also be low during the Creek low flow conditions because it receives water exclusively from runoff, much the like the receiving water body. Currently there exists no mechanism in the permit process by which these observations can be accounted for. For the purpose of the present permitting process, the model calculations in this report were carried out under Ohio EPAs suggested mixing model but the appropriateness of the model as it applies to intermittent discharges such as Bennoc, should be open for discussion.

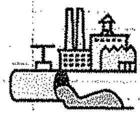
a. **Input Parameters**: The input data for the model is summarized below (see Table 4).
   i. Site Basin Water use: The model inputs include:
      1. Site Name: AEC Ponds 1 and 2 Refuse Area
      2. Permit Application Number: to be determined
      3. Receiving Water Body: Piney Creek
   ii. Hydrology: Hydrology information includes:
      1. Water Use Designation: CWH, AWS, IWS and PCR (Ohio EPA, April, 2010)
      2. Upstream Flow (7Q10) was calculated from site water balance and hydrologic information and was equal to 0.32 cfs. As a back-up the 7Q10 was also calculated using regional regression equations presented in USGS Water-Resources Investigation Report (WRIR) 86-4354. The 7Q10 for this estimating method was 0.27 cfs. The 0.32 cfs was used due to the inclusion of specific site data. (Attachments 4, 7 and 8)
      3. % of stream available for mixing: default = 20%
      4. Effluent flow: 0.065 cfs Pond 001 and 0.04 cfs for Pond 002 for a combined flow of 0.105cfs

Table 4. Waste Load Allocation Input Screen

Waste Load Allocation Model: Main Data Entry Screen (v3.2) | Instructions | Print Page

Note: Inputs allowed only in the turquoise shaded cells

Today's Date:	9/10/2012	Outfall:	ond 1 and 2
Revision History:		River Mile:	
Entity Name:	American Energy	Writer:	
Permit No:		Receiving water type:	stream
Receiving Stream/Water Body:	Piney Creek	Discharge within 500 yards of public water supply intake:	no



Use Designations:		
	Aquatic Life Use	CWH
	Water Supply	AWS, IWS
	Recreation	PCR
	Special	

design

Basin: Ohio River Basin

Select Parameters

	Units	Season	Value	Source	Percent of Stream to use in WLA
Upstream Flows					
7Q10	cfs	summer	0		20
		winter	0		20
		annual	0.32		20
1Q10	cfs	annual	0.32		20
30Q10	cfs	summer	0.32		20
		winter	0.32		20
90Q10	cfs	annual	0		20
Harmonic Mean Flow	cfs	annual	0.32		20
Mixing Assumption	%	average	20		
		maximum	20		
Downstream WQ:					
Temperature (75th percentile)	degrees C.	summer	22		
		winter	5		
pH (75th percentile)	standard units	summer	7.6		
		winter	7.6		
Hardness	mg/l	outside mixing zone	283		
	mg/l	inside mixing zone	283		
Effluent Design Flow (cfs)	0.105	(in MGD):	2.8		
Alternative Dilution Factors					
for Inside Mixing Zone Criteria (IMZM)			1		
for Outside Mixing Zone Maximum Criteria (OMZM)			1		
for Average Criteria			1		

Stream/Discharge Flow Ratio: 3.047619048

* ***Stream flow discharge ratio = (7Q10 receiving water flow/Effluent design Flow)***

iii. Chemistry (Receiving water): Includes temperature and hardness for correction factors related to toxicity
   1. Temperature: 22°C in summer, 5°C in winter
   2. pH = 7.6
   3. Hardness = 283 mg/L
   4. Background chemistry of receiving water body: Values from Ohio EPA downstream chemistry of Piney Creek (See Table 4, above and Attachment 9)

b. **Calculation of Projected Effluent Quality (PEQs):** This step involves entering the effluent data for the discharge or outfall (see Table 5 below) and the calculating a Projected Effluent Quality (PEQ) for each analyte. In general, the method inspects the effluent data quality in order to account for the possible variance in effluent chemistry. For example, if only one sample of effluent has been collected and analyzed, the PEQ is determined by multiplying the reported concentration by 6.2 (See Attachment 5). If the effluent has been sampled and analyzed 50 times, the PEQ is determined by multiplying the average concentration by a factor of 1. Therefore, the more robust the data set (the better the effluent data is characterized), the more likely the PEQ is to be equal to the average of the effluent analyte measurements. For this exercise, 4 samples have been collected (statistical factor = 2.6):

maximum PEQ = 2.6 x maximum daily average, and
average PEQ = 0.73 x the maximum PEQ

The complete effluent data set can also be found in Attachment 3.

Table 5. Input Data and PEQ Values

	Calculating PEQs (Projected Effluent Quality)							
American Energy								
Note: Cells shaded turquoise require data entry.				*** Under NO circumstances should you delete or insert rows. ***				
Parameter	Units	Number of Observations (n)	# > MDL	Method of Calculation (enter A or B)	Maximum Value	F Value	PEQ Average	PEQ Maximum
Aluminum	ug/l	4	1	A	1.24	2.6	2.35352	3.224
Ammonia-S	mg/l	1	0	A	0	6.2	0	0
Ammonia-W	mg/l	1	0	A	0	6.2	0	0
Arsenic - TR	ug/l	4	1	A	2	2.6	3.796	5.2
Barium	ug/l	1	0	A	0	6.2	0	0
Cadmium - TR	ug/l	1	0	A	0	6.2	0	0
Chlorides	mg/l	4	1	A	262	2.6	497.276	681.2
Chromium - TR	ug/l	1	0	A	0	6.2	0	0
Copper - TR	ug/l	4	1	A	11	2.6	20.878	28.6
Dissolved solids (ave)	mg/l	4	1	A	3138	2.6	5955	8159
Dissolved solids (max)	mg/l	4	1	A	4190	2.6	7952	10894
gamma-Hexachloro-cyclol	ug/l	1	0	A	0	6.2	0	0
gamma-Hexachloro-cyclol	ug/l	1	0	A	0	6.2	0	0
Iron - TR	ug/l	4	1	A	751	2.6	1425	1953
Manganese - TR	ug/l	4	1	A	969	2.6	1839	2519
Mercury - TR (BPO)	ug/l	1	0	A	0	6.2	0	0
Mercury - TR (APO)	ug/l	1	0	A	0	6.2	0	0
Nickel - TR	ug/l	1	0	A	0	6.2	0	0
Nitrate-N + Nitrite-N	mg/l	1	0	A	0	6.2	0	0
Phosphorus	mg/l	1	0	A	0	6.2	0	0
Selenium - TR	ug/l	4	0	A	1.2	2.6	2.23	3.12
Strontium	ug/l	1	0	A	0	6.2	0	0
Sulfates	mg/l	4	1	A	2438	2.6	4627.324	6338.8
TKN	mg/l	1	0	A	0	6.2	0	0
Zinc - TR	ug/l	1	0	A	1	6.2	4.5	6.2

The calculated PEQs are next compared to the average preliminary effluent limitation (PEL) which is the lowest wasteload allocation (WLA) based on chronic criteria, and the maximum PEL is the lowest WLA based on acute criteria, this is calculated pursuant to rule 3745-2-05 of the Administrative Code. These numeric values can be found in the Table of PEQ values in Table 6 below. The comparison of PEQ values to PEL allows for a determination of whether the computed PEQ, the computed projected effluent concentration, comes close to the PEL (the allowable concentration) or has a potential to cause exceedances. The ratio (or percentage) of PEQ to PEL allows a classification of each analyte concerning its particular potential for exceedance. This is described in the next section.

Table 6. Table of PEQ max and PEQ avg to PEL values

Print Tables | Reasonable Potential - Part I: | *** Note: Under NO circumstances should you delete or insert rows. *** | American Energy

Instructions

		Average								Maximum					
Parameter	Units	Wildlife	Human Health	Agricultural Supply	Aquatic Life	PELavg	PEQavg	%	Group	IMZM	Max. AQ Life	PELmax	PEQmax	%	Group
Aluminum	ug/l	--	--	--	--	--	2.35352	--	1	--	--	--	3.224	--	1
Ammonia-S	mg/l	--	--	--	1.8	1.8	0	--	1	--	--	--	0	--	1
Ammonia-W	mg/l	--	--	--	6.6	6.6	0	--	1	--	--	--	0	--	1
Arsenic - TR	ug/l	--	--	100	150	100	3.796	3.80	2	680	340	340	5.2	1.53	2
Barium	ug/l	--	--	--	220	220	0	0.00	2	4000	2000	2000	0	0.00	2
Cadmium - TR	ug/l	--	--	50	5.6	5.6	0	0.00	2	29	15	15	0	0.00	2
Chlorides	mg/l	--	--	--	--	--	497.276	--	1	--	--	--	681.2	--	1
Chromium - TR	ug/l	--	--	100	200	100	0	0.00	2	8500	4200	4200	0	0.00	2
Copper - TR	ug/l	--	1300	500	23	23	20.878	90.77	W	75	37	37	28.6	77.30	W
Dissolved solids (	mg/l	--	--	--	1500	1500	5955	397.00	W	--	--	--	8159	--	1
Dissolved solids (	mg/l	--	--	--	1500	1500	7952	530.13	W	--	--	--	10894	--	1
gamma-Hexachlo	ug/l	--	0.63	--	0.057	0.057	0	0.00	2	1.9	0.95	0.95	0	0.00	2
gamma-Hexachlo	ug/l	--	0.63	--	0.057	0.057	0	0.00	2	1.9	0.95	0.95	0	0.00	2
Iron - TR	ug/l	--	--	5000	--	5000	1425	28.50	W	--	--	--	1953	--	1
Manganese - TR	ug/l	--	--	--	--	--	1839	--	1	--	--	--	2519	--	1
Mercury - TR (BF	ug/l	--	0.012	10	0.91	0.012	0	0.00	2	3.4	1.7	1.7	0	0.00	2
Mercury - TR (AF	ug/l	--	0.012	10	0.91	0.012	0	0.00	2	3.4	1.7	1.7	0	0.00	2
Nickel - TR	ug/l	--	4600	200	130	130	0	0.00	2	2300	1100	1100	0	0.00	2
Nitrate-N + Nitrite	mg/l	--	--	100	--	100	0	0.00	2	--	--	--	0	--	1
Phosphorus	mg/l	--	--	--	--	--	0	--	1	--	--	--	0	--	1
Selenium - TR	ug/l	--	11000	50	5	5	2.23	44.60	W	--	--	--	3.12	--	1
Strontium	ug/l	--	--	--	5300	5300	0	0.00	2	95000	48000	48000	0	0.00	2
Sulfates	mg/l	--	--	--	--	--	4627.324	--	1	--	--	--	6338.8	--	1
TKN	mg/l	--	--	--	--	--	0	--	1	--	--	--	0	--	1
Zinc - TR	ug/l	--	69000	25000	290	290	4.5	1.55	2	580	290	290	6.2	2.14	2

c. **Analyte Classification-Reasonable Potential to Contribute to Exceedances**: Based on the PEQ and PEL calculations shown above, analytes in the effluent are classified according to their potential to exceed acute or chronic water criteria and the recommended monitoring requirements. Table 7 below describes the actions taken from a monitoring perspective for the different classes (Class 1 through 5):

Table 7: Parameter Assessment and Classification by Group and Monitoring Options

Group 1: Due to a lack of criteria, the following parameters could not be evaluated at this time.

*** Note: Under NO cir
should you delete or in

Aluminum	Chlorides	Manganese - TR
Phosphorus	Sulfates	TKN

Group 2: PEQ < 25 percent of WQS or all data below minimum detection limit.
WLA not required. No limit recommended; monitoring optional.

Arsenic - TR	Barium	Cadmium - TR
Chromium - TR	gamma-Hexachloro-cyclohexane (Lin	gamma-Hexachloro-cyclohexane (Lindane) (APO)
Mercury - TR (BPO)	Mercury - TR (APO)	Nickel - TR
Nitrate-N + Nitrite-N	Strontium	Zinc - TR

Group 3: PEQ_{max} < 50 percent of maximum PEL and PEQ_{avg} < 50 percent of average PEL.
No limit recommended; monitoring optional.

Iron - TR	Selenium - TR

Group 4: PEQ_{max} >= 50 percent, but < 100 percent of the maximum PEL or
PEQ_{avg} >= 50 percent, but < 100 percent of the average PEL. Monitoring is appropriate.

Copper - TR

Group 5: Maximum PEQ >= 100 percent of the maximum PEL or average PEQ >= 100 percent of the average PEL, or either the average or maximum PEQ is between 75 and 100 percent of the PEL and certain conditions that increase the risk to the environment are present. Limit recommended.

Limits to Protect Numeric Water Quality Criteria

Parameter	Units	Period	Recommended Effluent Limits Average	Maximum
Dissolved solids (ave)	mg/l		2244	--
Dissolved solids (max)	mg/l		2244	--

d. **Water Quality in the Study Area and Summary of Effluent Limits to Maintain Applicable WQ Criteria:** Table 8 shows the result of the waste load allocations for each analyte in the effluent data set. Using mass balance for the receiving water and effluent discharge, the amount of permissible effluent concentrations can be calculated. The equation used is:

$$[WQS\ (Q_{eff}+Qup)-Q_{up}(WQ_{up})]/Q_{eff}$$

Where WQS = applicable water quality standard
Qeff = effluent flow
Qup = receiving water flow
Wqp = background concentration

In general the maximum allowable effluent concentrations used to determine end-of –pipe effluent limitations are the Outside Mixing Zone and Inside Mixing Zone Maximum Criteria

(IMZM) for Aquatic Life. Since the OMZM limits are stricter than the IMZM limits, we will compare Pond effluent to the OMZM, since limitations met under OMZM conditions will also meet IMZM limits.

Table 8: Summary of Maximum Allowable Effluent Concentrations for Metals, Trace Elements and Other Water Quality Parameters.

Table 7.	Summary of Effluent Limits to Maintain Applicable WQ Criteria					
		Outside Mixing Zone Criteria				Inside Mixing Zone Maximum
		Average			Maximum	
Parameter	Units	Human Health	Agri-culture	Aquatic Life	Aquatic Life	
Aluminum	ug/l	--	--	--	--	--
Ammonia-S	mg/l	--	--	--	--	--
Ammonia-W	mg/l	--	--	--	--	--
Arsenic - TR	ug/l	--	160	241	547	680
Barium	ug/l	--	--	311	3176	4000
Cadmium - TR	ug/l	--	79	7.2	22	29
Chlorides	mg/l	--	--	--	--	--
Chromium - TR	ug/l	--	161	322	6760	8500
Copper - TR	ug/l	2091	804	36	58	75
Dissolved solids (ave)	mg/l	--	--	2244	--	--
Dissolved solids (max)	mg/l	--	--	2244	--	--
gamma-Hexachloro-cyclohexan	ug/l	1	--	0.092	1.5	1.9
gamma-Hexachloro-cyclohexan	ug/l	0.63	--	0.057	0.95	1.9
Iron - TR	ug/l	--	7952	--	--	--
Manganese - TR	ug/l	--	--	--	--	--
Mercury - TR (BPO)	ug/l	0.018	16	1.5	2.7	3.4
Mercury - TR (APO)	ug/l	0.012	10	0.91	1.7	3.4
Nickel - TR	ug/l	7403	321	209	1770	2300
Nitrate-N + Nitrite-N	mg/l	--	161	--	--	--
Phosphorus	mg/l	--	--	--	--	--
Selenium - TR	ug/l	17704	80	7.4	--	--
Strontium	ug/l	--	--	8376	77102	95000
Sulfates	mg/l	--	--	--	--	--
TKN	mg/l	--	--	--	--	--
Zinc - TR	ug/l	111051	40232	461	461	580

i. Copper: Because copper effluent concentrations are projected to be greater than 75% of the PEQ, a simple waste load calculation is performed to determine if copper effluent loading will exceed the receiving water loading capacity. This calculation is shown below and is automatically performed by the program. Applicable equations and inputs are also noted. The results (Table 9) show that copper will not exceed the receiving water loading capacity.

Table 9. Copper Waste Load Allocation results

Application of the Loading Test [OAC 3745-2-06(B)(1)(b)]			Print page
Parameter name:	Copper - TR - PEQaverage = 80.3 % of PELaverage		
	Loading capacity	=	WQS * (100% of upstream flow + effluent flow)
		=	17 ug/l * (.32 cfs + .105 cfs) * 0.0024467 (conversion factor)
		=	.0176774075 kg/day
	Background load	=	(background concentration * 100% of upstream flow)
		=	2 ug/l * .32 cfs * 0.0024467 (conversion factor)
		=	.001565888 kg/day
	Effluent Load	=	WLA * effluent flow
		=	26 ug/l * .105 cfs * 0.0024467 (conversion factor)
		=	.006679491 kg/day
	Total Load	=	Background Load + Effluent Load
		=	.001565888 kg/day & .006679491 kg/day
		=	.008245379 kg/day
	Total Load / Loading Capacity	=	46.64%
	*** Therefore, Copper - TR remains a Group 4 parameter.		

ii. Sulfates and TDS: Water Quality Standards for sulfate, chloride and TDS are not included in the Waste Allocation spreadsheet (see Attachment 6). These are given special consideration for mining sites and individual coal mine permits. For sulfate the WQS is considered as: "in permits where sulfate is the primary toxic component of TDS (sulfate is 78% of TDS in this case), a maximum sulfate WQ BEL (water quality based effluent) is used instead of a maximum TDS WQBEL." The sulfate WQS, according to Ohio EPA, is then computed from the background chloride and hardness data. The 25th percentile chloride and hardness data from the reference data set for mine affected sites are used as default values where no background data exist. The recent background water quality from Piney Creek was used for input values. The Ohio EPA Sulfate Spreadsheet is shown below:

Calculation of Sulfate WQS	Acute WQS for Sulfate= [-57.478+5.79(hardness) + 54.163(chloride)]*0.65.			
	IMZM = 1.3 (OMZM)			
	Hardness (ppm) =	283		(can't exceed 500 ppm. If > 500 use 500 in formula)
	Chloride (ppm) =	168		
	Acute WQS Sulfate =	6942	ppm	outside
	IMZM Sulfate =	9025	ppm	inside
Calculation for Chloride WQS	Acute Chloride WQ Criteron = 287.8*((hardness)^0.205797) * (sulfate^-0.07452)			
	Chronic Chloride WQ Criteron = 177.87((hardness)^0.205797) * (sulfate^-0.07452)			
	hardness (ppm) =	283		Above formulas are from Chris Skalski's Oct 13,2010 memo
	sulfate (ppm) =	554		
	Acute WQS Chloride =	578	ppm	0
	Chronic WQS for Chloride =	357	ppm	

The relevant equation is:

Acute Sulfate Criterion = [-57.478+5.79(hardness) + 54.163(chloride)]*0.65

Using the recommended background reference input of 168mg/L for Cl and 283 mg/L for hardness (Attachment 9 from Ohio EPA), the sulfate WQS is:

Sulfate WQS = 6942 mg/L.

This acute sulfate criterion also equals the Outside Mixing Zone Maximum (OMZM). The Inside Mixing Zone Maximum (IMZM) can be calculated by multiplying the OMZM by 1.3 or:

IMZM Sulfate= 9025 mg/L

As with the other constituents, this calculated WQS for sulfate can be compared to the effluent values to determine if it exceeds the water quality standards.

Once the waste load allocations have been determined, the effluent data can be compared to the OMZM or IMZM to determine which constituents may exceed the water quality standards. The results of the waste load allocation exercise for the effluent data from Pond 001 are summarized in the Table below.

Table 10. Combined Flow Chemistry Compared to Maximum Allowable Effluent Concentrations

Analyte	Maximum Allowed (OMZM)	Pond 001 and 002 Combined Flow Effluent
Sulfate	6942 mg/L	2473.5 mg/L
Chloride	578 mg/L	195 mg/L
Iron	No OMZM (7952 ug/L = Average OMZM for Agricul.)	479 ug/L
Aluminum	No OMZM	504 ug/L
Manganese	No OMZM	190 ug/L
Copper	58 ug/L	6 ug/L
Zinc	461 ug/L	1 ug/L
Arsenic	547 ug/L	0.8 ug/L
Selenium	7.4 ug/L (Average OMZM Aquatic Life)	1.2 ug/L

Under the combined Pond 001 and Pond 002 effluent scenario described here, all metals, metalloids, and chloride concentrations are well below the maximum IMZM or OMZM values. Sulfate is also significantly lower than the recommended water quality standard or waste load allocation OMZM value.

3.) Analysis of Anti-degradation

Based on the analysis of the combined effluent discharges from Pond 001 and Pond 002, it is not expected that degradation to the receiving water will occur. Therefore, the preferred option regarding Ponds 001 and Pond 002 involves: (1) continued pond management to maximize retention time and aeration in order to encourage the in-pond geochemical changes described earlier, (2) In-pond pH adjustment to between pH 6.5 and 9, if necessary, and (3) use of curtains/baffles within the pond to aid in settling. Under this scenario, the enhanced aeration/precipitation cycle would be followed by direct discharge to Piney Creek. The effluent is expected to meet all water quality standards including sulfate.

4.) Summary

The Ohio EPA Waste Load Allocation Model was used to determine the maximum allowable effluent concentrations for the proposed combined effluent discharge from Ponds 001 and 002 at the AEC Bennoc site into Piney Creek. The model output shows that:

- Metals, metalloids, sulfate and chloride will not exceed the allowable levels when compared to the OMZM (or IMZM), and in fact are likely to be well below allowable levels for most constituents of concern.
- Based on the comparison of effluent chemistry to the OMZM allowable levels, Ohio EPA permit levels should be no lower than the OMZM levels (or IMZM) noted in Table 10.
- The preferred alternative is to continue discharge utilizing aeration, retention time and sedimentation to decrease metal and metalloid concentrations.
- The underlying concept used in the model for mixing of the discharge with the receiving water should be discussed further. While the concept makes sense for industrial processes that discharge continuously regardless of ambient meteoric conditions, it does not make sense for scenarios where both the discharging water body flows and the receiving water body flows are both dependent on the same environmental conditions such as runoff. Currently there exists no mechanism in the permit process by which these observations can be accounted for.
- The model currently uses a default value of 20% for the volume of receiving water available for mixing. Because the ratio of 7Q10 flow to effluent design flow is relatively low (about 3), it is expected that a higher percentage of stream mixing volume could be used in the calculations. Based on this, it is expected that the allowable levels for discharge would increase as well. Again, based on this observation and the nature of the intermittent discharge due to runoff, some discussion about the appropriate mixing values is necessary.

ATTACHMENTS

ATTACHMENT 1

Pond 013 Effluent Data

Laboratory Analyses

Permit: D-0425 | Site: Pond 013

Parameter	Dates 12/22/2011	1/5/2012	1/12/2012	1/18/2012	Units	Method	PQL	MDL
Flow	12,144	In Pond	20	14,200	GPD	-	-	-
Temperature, Field	9.5	9.8	7.6	5.4	°C	-	-	-
pH, Field	8.44	7.3	7.54	8.26	S.U.	-	-	-
pH, Lab	8	8.35	7.8	7.83	S.U.	4500HB	-	-
Acidity (as CaCO3)	2.62	ND	8.49	3.36	mg/L	2310B	0.5	0.17
Alkalinity (as CaCO3)	129	155	213	99.4	mg/L	2320B	0.18	0.06
Carbonate Alkalinity	ND	ND	ND	ND	mg/L	2320B	0.18	0.06
Bicarbonate Alkalinity	129	155	213	99.4	mg/L	2320B	0.18	0.06
Chloride	197	262	174	145	mg/L	4500Cl D	0.5	0.1
Hardness (as CaCO3)	189	712	735	411	mg/L	2340B	0.1	0.0244
Nitrate (as N)	0.09	-	-	ND	mg/L	E352.1	0.2	0.1
Total Phosphate	0.073	0.009	ND	ND	mg/L	4500PE	0.01	0.003
Specific Conductance	4334	5520	3740	3360	µmhos/cm	120.1	5	1
Total Suspended Solids	25	14	ND	5	mg/L	2540C	15	4.75
Total Dissolved Solids	3050	4190	2860	2450	mg/L	2540C	50	13.5
Total Sulfate (as SO4)	2410	3320	2160	1860	mg/L	D516-02	3	0.9
Total Aluminum	1.24	0.385	0.01	0.38	mg/L	E200.7	0.1	0.02
Total Arsenic	0.0004	0.0004	0.002	0.0005	mg/L	3114B	0.001	0.0001
Total Calcium	-	229	243	132	mg/L	E200.7	1	0.05
Total Copper	0.011	0.005	0.005	0.004	mg/L	E200.7	0.004	0.00071
Total Iron	0.751	0.43	0.341	0.394	mg/L	E200.7	0.1	0.03
Total Magnesium	-	34.1	31	20	mg/L	E200.7	0.5	0.05
Total Manganese	0.175	0.197	0.969	0.168	mg/L	E200.7	0.02	0.006
Total Potassium	-	8.78	3.79	4.35	mg/L	E200.7	0.5	0.05
Total Selenium	0.0012	0.00005	0.0007	0.0004	mg/L	3114B	0.001	0.0001
Total Sodium	992	1460	716	692	mg/L	E200.7	100	5
Total Zinc	0.0015	0.0015	0.0015	0.0015	mg/L	E200.7	0.05	0.003

ATTACHMENT 2

Component	Total dissolved	% dissolved	Total sorbed	% sorbed	Total precipitated	% precipitated
HFO Site 1	0	0	0.00022472	100	0	0
HFO Site 2	0	0	0.000042504	100	0	0
Gibb Site 1	0	0	5.6175E-06	100	0	0
Al+3	2.0017E-09	0.011	0	0	0.000018677	99.989
AsO4-3	2.3453E-12	0.022	1.0675E-08	99.978	0	0
Ca+2	0.0050063	99.828	8.6248E-06	0.172	0	0
Cl-1	0.0055002	100	0	0	0	0
CO3-2	0.0024051	96.864	0.000077854	3.136	0	0
Cu+2	1.6542E-10	0.168	9.8189E-08	99.832	0	0
Fe+3	1.3885E-14	0	0	0	0.000008577	100
H+1	0.0024965	95.244	0.00012465	4.756	0	0
K+1	0.00014424	100	0	0	0	0
Mg+2	0.0011455	98.411	0.000018498	1.589	0	0
Mn+2	4.8963E-06	71.351	0.000001966	28.649	0	0
Na+1	0.041975	100	0	0	0	0
SeO4-2	5.3521E-08	68.163	2.4999E-08	31.837	0	0
SO4-2	0.025367	99.951	0.000012512	0.049	0	0
Zn+2	6.8559E-10	2.988	2.2261E-08	97.012	0	0

ATTACHMENT 3

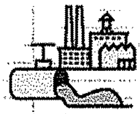
Waste Load Allocation Model: Main Data Entry Screen (v3.2)

Instructions

Print Page

Today's Date:	8/18/2012	Outfall:	and 1 and 2
Revision History:		River Mile:	
Entity Name:	American Energy	Writer:	
Permit No:			
Receiving Stream/Water Body:	Piney Creek		

Note: Inputs allowed only in the turquoise shaded cells



Receiving water type: stream

design

Discharge within 500 yards of public water supply intake: no

Use Designations:		
	Aquatic Life Use	CWH
	Water Supply	AWS, IWS
	Recreation	PCR
	Special	

Basin: Ohio River Basin

Select Parameters

	Units	Season	Value	Source	Percent of Stream to use in WLA
Upstream Flows					
7Q10	cfs	summer	0		20
		winter	0		20
		annual	0.32		20
1Q10	cfs	annual	0.32		20
30Q10	cfs	summer	0.32		20
		winter	0.32		20
90Q10	cfs	annual	0		20
Harmonic Mean Flow	cfs	annual	0.32		20
Mixing Assumption	%	average	20		
		maximum	20		
Downstream WQ:					
Temperature (75th percentile)	degrees C.	summer	22		
		winter	5		
pH (75th percentile)	standard units	summer	7.6		
		winter	7.6		
Hardness	mg/l	outside mixing zone	283		
	mg/l	inside mixing zone	283		
Effluent Design Flow (cfs)	0.105	(in MGD):	2.8		
Alternative Dilution Factors					
for Inside Mixing Zone Criteria (IMZM)			1		
for Outside Mixing Zone Maximum Criteria (OMZM)			1		
for Average Criteria			1		

Stream/Discharge Flow Ratio: 3.047619048

ATTACHMENT 4

Piney @ Mouth of Captina Data from USGS Stream Stats

Drainage Area	9.97 mi^2

Year_Peak Flow	**Peak Flow (ft^3/s)**
2	597
5	1010
10	1310
25	1700
50	1990
100	2300
500	3000

Month_Mean Flow	**Flow (ft^3/s)**
January	17.1
February	20.6
March	23.2
April	21
May	13.2
June	7.22
July	4.01
August	3.5
September	2.44
October	1.83
November	5.54
December	12

Percentile_Flow	**Flow (ft^3/s)**
25th	1.33
50th	4.86
75th	12.5

Mean Annual Flow (ft^3/s)	**Harmonice Mean Streamflow (ft^3/s)**
11.8	0.88

ATTACHMENT 5

Modeling Guidance 1 Final	Calculating PEQ: determining a discharger's effluent quality	
	Rule reference: OAC 3745-2-04 (D)	Revision 0, January 30, 1998 Revision 1, August 23, 2006

This guidance outlines two methods for calculating projected effluent quality (PEQ), as referenced in the Ohio Administrative Code at 3745-2-04 (D)(2) and (3). The method selected is dependent on case-specific facts, i.e., determined on a pollutant-specific basis using knowledge of the characteristics of the available data. In accordance with the rule, other methods may be used if they meet the requirements of OAC 3745-2-04 (D)(2) and (3). When a method other than those described here is used to calculate PEQ, a detailed justification of how such method meets the requirements of 3745-2-04 (D)(2) and (3) must be included in the fact sheet of the subject discharge permit. The justification for alternative methods could be prepared by the permit applicant or Ohio EPA.

Some general characteristics of effluent data, applicable to both methods, are discussed, along with considerations to be made in combining data from different sources.

Characteristics of Effluent Data

OAC rule 3745-2-04 (D)(1) describes desirable characteristics of effluent data that are used to calculate PEQ. Working within the confines of the rule, the following data situations should be examined closely:

1. Select a representative period of record. Examine plots of data to assure that significant changes in operation or monitoring are avoided. As allowed in OAC 3745-2-04(D)(1)(a), use the most recent five complete years unless another period is more appropriate.

2. Screen for high and low outliers. As allowed in OAC 3745-2-04(D)(1)(b), examine plots and raw data statistics to find extreme outliers at both the high and low ends of the data set. Remove outliers that may be caused by reporting errors or unusual (i.e., non-repeatable) plant operation or discharge conditions.

3. Select data that accurately represents long-term daily effluent variation. As allowed in OAC 3745-2-04(D)(1)(c), include only effluent data collected by grab sampling or composite sampling of no more than 24 hour duration. Other data can be used only if it can be demonstrated to represent the long-term daily variability of that pollutant. Do not include data which is suspect of collection, analysis, or recording errors. As allowed in OAC 3745-2-

04(D)(1)(d), if available data do not adequately represent projected changes in effluent quality, the available data (or the PEQ calculation method) may be adjusted to approximate the projected changes on a case-specific basis.

Combining Data from Multiple Sources

The rule is silent on the combination of data from multiple sources, but it is the longstanding practice of the Modeling Unit to carefully consider such combination. Combining data sets is easily accommodated in Method A and should result in more stable PEQ values; combination of data sets is possible using Method B, but the logistics are more difficult. The following guidelines should be used when considering whether to combine data sets:

1. When more than one source of effluent data is available for a parameter, evaluate the differences between the data sets.

2. Determine if data from multiple sources should be combined. Combine the data sets if they meet the following criteria:
   a. The data sets represent similar or contiguous periods of record, but the data points do not represent the same days or effluent events.
   b. The data sets have similar detection limits, or the differences in the detection limits do not adversely affect the PEQ statistics.
   c. The range of values in each data set are similar.

If PEQ Method A is applicable to the combined data sets and the detection limits are known (or can be accurately estimated), criteria b and c are not necessary because the procedure accounts for variations in detection limits and data ranges.

If the data sets cannot be combined, compute PEQ values separately for each data set. If the data sets are of similar size and period of record, use the data set with the highest PEQ. If one data set has significantly more data than the other, and all data of the smaller set are within or close to the range of the larger, use the larger data set. If the ranges differ significantly, use the data set which best represents the existing or projected effluent quality of the facility. If this cannot be determined, use the data set with the highest PEQ.

ATTACHMENT 6

Permitting of Dissolved Inorganics for Coal Individual Permits

Introduction

To provide some guidance through the changes related to TDS, we are providing district staff with rule citations and methods for developing WQ-based effluent limits and other permit conditions related to dissolved solids and its constituent ions.

The toxicity of total dissolved solids is related to both the toxic effect of specific ions and the total additive effect of those ions. An example of the first effect is that effluents that have the same overall TDS concentration may have different toxicities based on the anions present – discharges that have higher sulfate concentrations are more toxic than discharges where chloride is the primary anion. The toxicity of TDS in an effluent is also related to the concentration of bicarbonate ions (water hardness). Increases in water hardness mitigate toxic effects between hardness concentrations of 100 mg/l to 500 mg/l. Hardness concentrations above 500 mg/l may add to toxicity by adding to the total ion concentration in the water.

To account for the different toxicities of different ion mixes, we have developed formula to calculate water quality criteria for sulfate and chloride based on hardness. Usually limits are set for the primary anion based on receiving water hardness, and an assumed concentration of the other ion (Sulfate, being the primary anion in coal process wastewaters, has criteria that depend on hardness and chloride concentrations in the stream).

In permits where sulfate is the primary toxic component of TDS, a maximum sulfate WQBEL is used instead of a maximum TDS WQBEL.

Here is the formula:

Acute sulfate criterion = [-57.478+5.79(hardness) + 54.163(chloride)]*0.65. The maximum hardness used in this formula is 500 mg/l. If the receiving water hardness is >500 mg/l, use 500 mg/l in the criterion formula.

IMZM criterion = 1276.7 mg/l + (5.508*hardness) - (1.457*chloride)

Note that, unlike other aquatic life criteria, the IMZM for sulfate is less than two times the OMZM criterion.

Applications

We will be receiving either Application Form 2C or 2D for each site. Form 2C (existing sources and those new sources that can project data from existing facilities) will have data for sulfate from Part V, B. of the application. Form 2D (new facilities) will require an estimate of sulfate concentrations.

With either application, we should require the facility to submit effluent data for TDS and chloride. If the facility has downstream data for hardness and chloride on the receiving water, they should submit that, too. The downstream data is used to calculate the WQS for sulfate.

Any upstream data for sulfate, TDS or metals should also be required if available. In our modeling rules, median or mean concentrations are used as background if data are available from the receiving water or a representative local stream. If no background data are available, we would use the 25th percentile of a reference data set, such as the Western Allegheny Plateau (WAP) Ecoregion data shown below (again, specified in our modeling rules):

	Reference Sites			Mine-affected Sites		
Percentile	Hardness	Sulfate	Chloride	Hardness	Sulfate	Chloride
10	116	25	12	120	38	8
25	**145**	**33**	**18**	**196**	**72**	**13**
50	208	53	27	281	153	24
75	258	142	40	417	360	44
95	419	259	86	948	945	126

The data for mine-affected sites should be used if there has been any mining in the HUC-12 watershed. This should cover most of the waterbodies in coal-bearing areas of the WAP. For watersheds that have not had mining discharges or surface effects in the past, the ecoregion reference site data should be used.

The values in this table can be presented as default values to be used in the absence of local data. If the applicant wishes to collect local data, this data may guide that decision.

<u>Discharge Limits</u>

Limits for TDS are calculated in the same way as other WQBELs for TDS. You can use either the WLA spreadsheet, or calculate the limits by hand. The inputs for this allocation are:

WQS = 1500 mg/l

Annual 7Q10 flow – from USGS low-flow book or other reference (another discharger's WLA, for example). Remember to incorporate the % of effluent flow used in the allocation (the spreadsheet does this automatically) – [OAC 3745-2-05(A)(2)].

Effluent flow – "a reasonable measure of average flow" [OAC 3745-2-05(A)(4)(b)]. We normally use an upper bound of the average flow. Measures of this flow might be either the maximum 30-day average flow from the application, the 95th percentile of reported monthly average flows, or for new discharges, a design average flow.

Upstream concentrations of pollutants – Combine any upstream data reported by the applicant with any applicable data available from OEPA surveys or compliance samplings. The upstream concentration for the WLA is the 50th percentile if $N \geq 10$, or the mean if N is less than 10 samples. [OAC 3745-2-05(A)(3)]. If no representative data exists for a particular receiving water use data from: (1) an adjacent stream; or (2) background water quality data for the ecoregion or from the background water quality report. If data from (2) is used, the background concentration will be the 25th percentile of the data. [OAC 3745-2-04(E)(1)(b)].

Limits for sulfate need to be calculated by hand at the moment; criteria are not in the WLA spreadsheet yet. The downstream WQS are calculated from the downstream data. Measures

of hardness and chloride need to be calculated using the 50th percentile for $N \geq 10$, or the mean if N is less than 10 samples.[OAC 3745-2-04(E)(1) – This rule addresses only hardness, but it is reasonable to apply it to chloride as well]. If no representative data exists for a particular receiving water use 25th percentile data from the WAP Ecoregion in the table above.

Effluent data may be used in this calculation only if the pond or other treatment system represents the headwater of the stream.

Effluent flows for sulfate and metals should be the same as those used in the TDS WLA.

Critical flows should be used in the WLA calculation, as provided in our modeling rules, as a default. For sulfate maximum criteria, use the 1Q10 flow. For metals and other pollutants, the critical flows are:

Average aquatic life: 7Q10 (except ammonia-N: 30Q10)

Maximum aquatic life: 1Q10 (except ammonia-N: 7Q10)

Human Health and Agricultural Water Supply: Harmonic mean

These outfalls may not discharge at critical flows. If the discharge does not occur to the head of a stream, WLAs and permit conditions can be structured to reflect alternate dilutions. In this case, a minimum stream flow needs to be defined, and the permit written to prohibit discharges at flows less than the defined stream flow (similar to permit conditions for controlled lagoon types of sewage treatment plants). All WLAs would be calculated using this alternate dilution; all reasonable potential determinations and permit conditions would be based on this alternate dilution unless a critical flow WLA yields a higher WLA.

Note that the mixing zone ban applies to allocations for mercury and other bioaccumulative chemicals of concern (BCCs). WLAs and any needed limits for mercury must be based on WQS at the discharge point.

<u>Monitoring</u>

Process discharges should be monitored for other components of TDS at a quarterly frequency. These include sodium, calcium, magnesium, hardness and chloride. For existing discharges, or new dischargers using Form 2C, the permit should also contain monitoring requirements for selenium, low-level mercury and any other metals that are listed in Group 4 or Group 5 of the WLA hazard assessment. For new dischargers using Form 2D, the permit should include monitoring for all priority pollutant metals at least annually (selenium and mercury should be at least quarterly).

ATTACHMENT 7

Piney Creek Flows

Average Year	Flows to Piney Creek in Gallons per Month												
	January	February	March	April	May	June	July	August	September	October	November	December	Total
Piney Creek Water shed Up Stream AEC	603,145,185	368,176,150	530,412,114	361,779,897	284,898,810	150,620,676	131,274,943	130,530,170	313,725,589	133,318,852	230,047,900	351,615,055	3,609,646,240
Down Stream from AEC	45,493,447	29,278,972	40,007,408	27,283,823	21,491,069	11,354,516	9,895,302	9,839,748	23,659,070	10,052,842	17,351,829	26,521,353	272,229,180
Dry Year													
Piney Creek Water shed Up Stream AEC	205,055,560	193,001,945	281,312,278	230,198,347	73,455,864	25,101,068	13,227,899	12,543,511	6,200,418	7,153,454	13,315,667	133,806,520	1,195,357,550
Down Stream from AEC	15,534,616	14,557,563	21,218,548	17,358,818	5,535,014	1,886,952	991,365	940,356	469,848	538,561	1,004,361	10,092,553	90,126,566
Wet													
Piney Creek Water shed Up Stream AEC	1,377,892,890	609,154,162	1,031,984,212	584,389,454	407,969,687	289,595,649	298,067,512	154,768,408	1,397,717,224	273,000,844	316,870,265	584,082,133	7,315,392,440

ATTACHMENT 8

PINEY CREEK 7Q10 HYDROLOGIC ANALYSIS

Piney Creek is located in the southern part of Belmont County in the Central Ohio River Tributaries Watershed Basin. Piney Creek serves as a tributary to Captina Creek and its confluence lies approximately 2 miles west of Alledonia. Ohio Environmental Protection Agency (OH EPA) has designated water uses on Piney Creek as warmwater habitat (WWH), agricultural water supply (AWS), industrial water supply (IWS), and primary contact recreation (PCR). Hydrology was evaluated on Piney Creek at the proposed Outfall 001 location for the anti-degradation and waste load allocation analysis. Waste load allocations (WLA) for Piney Creek require a seven-day, ten-year design flow (7Q10) for average aquatic life criteria.

A search of the USGS National Water Information System (NWIS) database revealed that no stream gages exist on Piney Creek. Therefore, regional regression equations presented in USGS Water-Resources Investigation Report (WRIR) 86-4354 were used in calculating the lowest seven-consecutive-day average flow expected to occur once every ten years (7Q10) on Piney Creek. The USGS WRIR 86-4354 divides Ohio into five watershed regions and provides several different equations to estimate the desired low flow. Piney Creek is in Region 5 and includes basin-characteristic inputs for total drainage area, A (mi^2) and main channel length, L (mi). The 7Q10 Region 5 regression equation is:

$$7Q10\ (cfs) = 0.744 * A^{2.57} * L^{-3.72} - 0.1$$

USGS Topographic Quadrangle Images were used to delineate the drainage area and main channel lengths. The drainage area to Outfall 001 is 9.2 square miles and the main channel length is 5.6 miles. The resulting 7Q10 is 0.27 cfs.

The stream/discharge ratio (SDR) is the ratio of annual 7Q10 to effluent design flow, and is used to determine the percent of stream flow used in the WLA analysis. Since the annual 7Q10 is less than 1.0, 100% of the applicable stream design flow shall be used. The SDR was calculated for comparison and is equal to 4.2 and 6.8 for individual discharges of Outfalls 001 and 002, respectfully. For combined discharges of the two Outfalls, the SDR is equal to 2.6. Since the SDR is less than 10, 100% of the applicable stream design flow would be used in the WLA.

A flood frequency analysis was also performed on Piney Creek at Outfall 001 by utilizing the USGS StreamStat program. StreamStat implements regression equations from USGS WRIR 03-4164 to estimate the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year peak flows, mean annual flow, mean monthly flows, harmonic mean flow, and 25th-, 50th-, and 75th-percentile flows. Basin characteristics and discharges for the select hydrologic events are summarized below.

Basin Characteristics, Piney Creek at Outfall 001	
Drainage Area	9.2 mi^2
Percent Forest	52.3 %
Mean Annual Precipitation	41.12 in
Streamflow Variability Index	0.66
Main Channel Length	5.6 mi

Piney Creek Design Discharges at Outfall 001		
Flow Event	**Discharge (cfs)**	**Prediction Error (%)**
Harmonic Mean	0.85	66
PK-2	577	37
PK-5	983	35
PK-10	1280	34
PK-25	1670	35
PK-50	1970	37
PK-100	2270	38
PK-500	2980	42
Annual Mean	10.9	11
January Mean	15.7	17
February Mean	19.1	12
March Mean	21.4	14
April Mean	19.4	11
May Mean	12.2	20
June Mean	6.7	27
July Mean	3.7	28
August Mean	3.3	37
September Mean	2.3	44
October Mean	1.7	51
November Mean	5.1	38
December Mean	11.1	22
25^{th} Percentile	1.3	29
50^{th} Percentile	4.6	40
75^{th} Percentile	11.6	48

ATTACHMENT 9

Parameter	Result	Unit					
Alkalinity	191	mg/L			1460		654
Aluminum	<200	ug/L			1060		483
Ammonia	<0.050	mg/L			936		441
Arsenic	<2.0	ug/L			2050		978
Barium	96	ug/L			1730		790
Cadmium	<0.20	ug/L			2470		697
Calcium	87	mg/L			1680		194
Chloride	134	mg/L			540		194
Chromium	<2.0	ug/L			540		
COD	<20	mg/L					
Conductivity	2220	umhos/cm		TDS Ave	1385	Sulfate Ave	554
Copper	7.3	ug/L					
Hardness, Tota	295	mg/L			295		134
Iron	142	ug/L			261		94.1
Lead	<2.0	ug/L			246		88.4
Acidity	<5.0	mg/L			373		273
Magnesium	19	mg/L			323		225
Manganese	17	ug/L			414		339
Mercury	<0.20	ug/L			307		214
Nickel	3	ug/L			163		73.4
Nitrate+nitrite	<0.10	mg/L			163		73.4
Nitrite	<0.020	mg/L					
Potassium	3	mg/L		Hardness Ave	283	Chloride Ave.	168
Selenium	2.4	ug/L					

Investigation of Unnamed Tributaries to Piney Creek

NPDES Permit Application OIL 00159

Bennoc Refuse Area

American Energy Corporation

September 10, 2012

By: Murray Energy Corporation

Introduction

An investigation was performed on unnamed tributaries for the NPDES permit application number OIL00159 for the American Energy Corporations (AEC) ODNR permit number R-1159-11, the proposed Bennoc Refuse Area, located in Belmont County Ohio. The investigation area receives drainage from an area which has been used for mining purposes since 1969 for the former Allison mine and currently AEC. The most recent reclamation was performed on the area was for AEC permits 1159-4 (issued 2-24-02) and 1159-7 (issued 12-09-03) with a combined area of approximately 36 acres. Those permits included two sediment ponds, which will be utilized as Pond 23 and Pond 24 in the pending permit application. The proposed outfall locations were analyzed for the physical, chemical and biological characteristics of the receiving waters for outfalls 023 and 024. Water samples were collected by approved methods and analyzed by an accredited laboratory.

This investigation was performed in an area that has been reclaimed. The surface runoff from this site drains to Pond 23 and Pond 24. Pond 23 will drain to proposed Outfall Unnamed tributary 23, and Pond 24 will drain to proposed Outfall Unnamed tributary 24, both unnamed tributaries to Piney Creek. During the investigation, these ponds were not discharging. The field investigation represents the existing conditions for the unnamed tributaries 23 and 24.

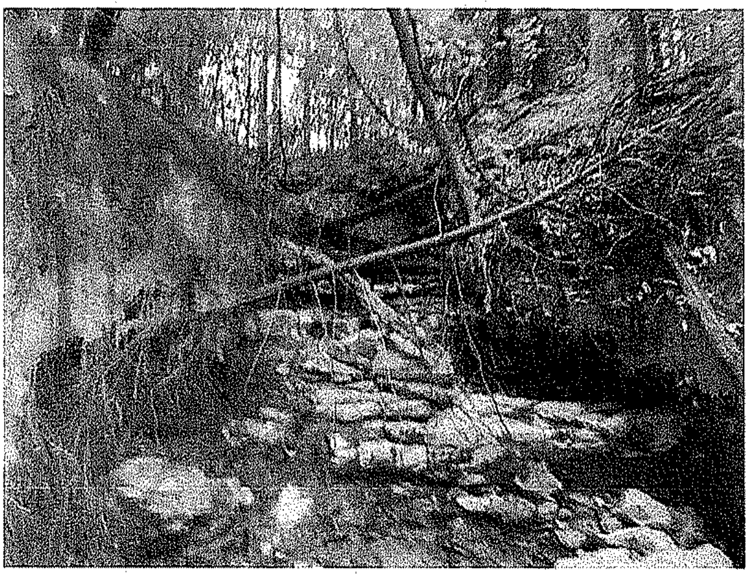
The field investigation was performed July 13, 2012. The following outfall receiving locations were investigated; Outfall Unnamed tributary 23 and Outfall Unnamed tributary 24. Each area is discussed in detail below.

Outfall Unnamed tributary 23

Physical characteristics

The field investigation of the area revealed a moist channel with few isolated pools and the absence of discharge from the existing sediment pond. The unnamed tributary has a drainage area of less than 0.01 mi^2; the pool depth and water volume are normally insufficient to support biological criteria associated with other sub-categories of life described in the OAC Rule 3745-1-07. The substrate was predominately bedrock with an average bank full width of approximately 1.75 meters and an average slope of 60%. This location is approximately 730 linear feet from Piney Creek. Pictures of the physical habitat are below.

Unnamed tributary 23 downstream view of physical habitat



Unnamed tributary 23 upstream view of physical habitat

Biological characteristics

The habitat in the unnamed tributary channel was of moderate quality for macroinvertebrates and salamanders, but there was a lack of biology found in the unnamed tributary. An investigation of the biology yielded two adult northern dusky salamanders (*Desmognathus fuscus*) and one fishfly larvae (family Corydalidae) both of which can be found in habitats that lack flowing water. The specific organisms that are located within this unnamed tributary, along with a lack of abundance and diversity, illustrate low quality biological function indicating that the system would be unable to sustain more complex biological communities.

Chemical characteristics

Samples were collected for chemistry analysis and can be found in the table below. The chemistry analysis indicates that the water present in the unnamed tributary channel was not of similar quality to the water in the adjacent ponds. The table below summarizes the chemical parameters.

Parameter	Unnamed tributary 23	Pond 23	Units
Temperature	18.1	27.3	°C
pH, Field	7.47	8.25	S.U.
pH, Lab	7.68	8.24	S.U.
Specific Cond.	1420	3860	µmhos/cm
TSS	7.0	16	mg/L
Iron	0.043	0.083	mg/L
Manganese	0.065	0.428	mg/L

Outfall Unnamed tributary 24

Physical characteristics

The field investigation of the area revealed a flowing unnamed tributary channel with iron-staining present within the unnamed tributary channel. There was no indication of discharge from the existing sediment pond. The unnamed tributary has a drainage area of less than 0.01 mi^2; the substrate was predominately bedrock with an average bank full width of approximately 1.68 meters and an average slope of 50%. This location is approximately 963 linear feet from Piney Creek. Pictures of the physical habitat are listed below.

Unnamed tributary 24 downstream view of physical habitat

Unnamed tributary 24 upstream view of physical habitat

Biological characteristics

The habitat in the unnamed tributary channel was of moderate quality for macroinvertebrates and salamanders, but there was a lack of biology found in the unnamed tributary. An investigation of the biology yielded very few Planaria and Chironomids, both of which tend to be pollution tolerant organisms indicating that it has low quality biological value. The specific organisms within this unnamed tributary, along with a lack of abundance and diversity, illustrate low quality biological function indicating that the system would be unable to sustain more complex biological communities.

Chemical characteristics

The existing unnamed tributary has elevated levels of iron, manganese, TSS, and conductivity. See the table below for a summary of the chemical analyses. The chemistry analysis indicates that the water present in the unnamed tributary channel was not of similar quality to the water in the adjacent ponds.

Parameter	Unnamed tributary 24	Pond 24	Units
Temperature	21.5	27.8	°C
pH, Field	7.59	8.89	S.U.
pH, Lab	7.31	8.4	S.U.
Specific Cond.	2380	252	µmhos/cm
TSS	7.0	3.0	mg/L
Iron	0.835	0.081	mg/L
Manganese	6.19	0.043	mg/L

Conclusion

Based on the field investigation preformed on the site, the unnamed tributaries for future Outfalls 23 and 24 have water present that is not associated with the adjacent ponds. The receiving waters have physical habitat that is of moderate quality, but lack biological populations which indicate any type of higher biological function. It can be concluded that based on the information gathered as a part of this investigation the unnamed tributaries for Outfall 23 and Outfall 24 are unable to sustain more complex biological communities.